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METHODS

Bringing stakeholder values into environmental policy choices: a community-based estuary case study

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Abstract

This paper discusses a methodology for joining deliberation and analysis, using the case-study example of a National Estuary Program planning effort in Tillamook Bay, OR, USA. We describe the development of a community-based evaluation tool that links actions proposed by technical experts (e.g. biologists, ecologists, engineers) to restore functioning of the Tillamook Bay estuary with the values and concerns expressed by community residents. This task required the explicit consideration of trade-offs across multiple benefits, costs, and risks. We describe the design and results of an evaluation workbook, developed with input from both the EPA staff and community residents, that provided insight to decision makers by presenting participants with explicit choices across the key dimensions and consequences of proposed actions. The final section of the paper discusses the successes and limitations of the project in relation to evaluation needs associated with other environmental policy initiatives.

Keywords: Stakeholder; Values; Environmental policy; Trade-offs

1. Introduction

Many environmental policy initiatives currently funded through federal or state governments share, at their center, three fundamental promises. One is a pledge to incorporate stakeholder values and, in particular, the preferences of potentially affected communities into whatever decisions eventually are made. A second is a promise to use good science, which usually appears in the form of input from expert technical committees that are brought together to address difficult, and at times controversial, aspects of a project's anticipated impacts. A third is the promise to use scarce funds wisely, which requires an analysis of the economic implications of the choices under review and a comparison of any initiative's economic benefits and costs.

However, the history of environmental policy implementation shows that it is difficult to achieve

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success on any two of these objectives simultaneously, let alone all three together. A frustratingly large number of environmental policy initiatives have been marked, and at times stopped altogether, by the combination of a lack of stakeholder acceptance along with controversy about the scientific analysis of impacts or a failure to demonstrate the economic justification of a proposed choice. Undoubtedly, many of the projects under review fully deserved to be redesigned or halted. Yet this is an expensive and time-consuming way to get nowhere. It seems far wiser to incorporate stakeholder values, good science, and economic valuation directly into the design of project or program alternatives so that, by the time a recommendation is advanced, there is a high probability that it will meet with broad-based approval and, in turn, succeed in achieving its stated goals.

This perspective on what it takes to build a good project is consistent with the vision outlined in the National Research Council's (1996) report, Understanding Risk, which discusses the need for deliberation (stakeholder involvement) and analysis (involving both physical and social science input) as two critical aspects of project design. It is also consistent with the mandate of the National Estuary Program (NEP), which was established in 1987 by amendments to the Clean Water Act with the purpose of identifying, restoring, and protecting nationally significant estuaries throughout the United States. Unlike many other regulatory initiatives, the NEP targets a broad range of issues and addresses the multiple dimensions associated with effective management of the watershed, including market (e.g. jobs, revenue) and non-market (e.g. recreation, aesthetics) values as well as the biological, physical, and chemical properties of the estuary and surrounding areas.

This paper discusses a methodology for meeting the NRC mandate of joining deliberation and analysis, using the case-study example of an NEP estuary management planning effort in Tillamook Bay, OR. We describe the development of a community-based evaluation tool that links actions proposed by technical science experts (e.g. biologists, ecologists, engineers) to restore functioning of the Tillamook Bay estuary with the values and concerns expressed by community residents. Sections 2 and 3 provide background on the context for selecting and structuring actions and on methods for encouraging public input to the Tillamook valuation efforts. Section 4 presents the design of an evaluation workbook that was completed with input from community residents and, in Section 5, we present the results of this effort. The final section of the paper discusses the successes and limitations of the project in relation to NEP and NRC goals.

2. Policy context

The Tillamook Bay watershed is located in northwestern Oregon. It supports diverse living resources, including shellfish, runs of salmon and trout, groundfish, and numerous bird species. It is integral to the local and regional economies that are largely based on natural resources, including forestry, agriculture, tourism/recreation, and commercial fishing. The local dairy industry is particularly important, with a variety of Tillamook cheeses marketed throughout the world as unusual, high-quality products that derive from the pristine environment of the coastal Tillamook watershed.

The stated goal of the Tillamook Bay National Estuary Project (TBNEP) was to develop a science-based, community-supported management plan for the watershed. The efforts of a staff of four to eight people began in 1995 and have been aided by the ongoing work of approximately 25 members of the TBNEP Management Committee. This committee, made up of local citizens and agency representatives from regional, state, and federal governments, took a lead role in the research and analysis leading to development of a Comprehensive Conservation and Management Plan (CCMP) for the Tillamook Bay watershed. A draft of this plan was released in September, 1998. After review and revision, a final version of the CCMP was scheduled for completion in July, 1999.[1] The project described in this report began early in 1998.

[1] The official signing of the Tillamook Bay CCMP took place February 9, 2000.

The principal emphasis of our project was an evaluation of the consequences of proposed CCMP actions in terms of their associated environmental and economic consequences. Our early value-elicitation sessions with stakeholders confirmed that their primary need was for assistance in working through what was perceived to be an impossibly complex set of benefits, costs, and risks. As a result, an important objective of our evaluation work was to create a simple, accessible tool for providing insight about the key trade-offs to citizens and, in turn, to decision makers. This required the identification of stakeholder values relevant to environmental policies developed for the Tillamook Bay Estuary area and linking these values to specific resource-management actions. Our techniques included standard tools of economic and environmental impact analysis as well as new, experimental methods (the focus of this paper) for estimating trade-offs across different components of value. In addition, new approaches were developed for encouraging the broad-based participation of community residents, along with key local and state agencies, in the development and assessment of priority TBNEP actions. These efforts required working closely with NEP staff and coordinating with stakeholders (e.g. local citizen, county, and state participants as well as technical experts) who were interested in the consequences of the protection or restoration initiatives under consideration for the watershed.

3. Structuring the evaluation setting

The evaluation approach used at Tillamook Bay has a conceptual basis in the theory of multiattribute utility (MAUT) analysis (Keeney and Raiffa, 1993) and the techniques of decision analysis (von Winterfeldt and Edwards, 1986; Clemen, 1996). As discussed in more detail later, the conduct of both the initial small-group sessions (used for eliciting values information) and the expert interviews (used for eliciting factual information) reflect the assumption that many of the key policy decisions residents and other stakeholders will be asked to make involve trade-offs between environmental, economic, health, and social effects that previously have not been thought about carefully. Rather than simply reporting already existing values, participants need to actively construct preference orders (expressed as rankings or in dollar terms) on the basis of their personal beliefs as well as their interpretation of the cues contained in the questions they are asked or the information they are shown (Slovic, 1995; Gregory and Slovic, 1997). As a result, evaluation tasks should be structured so as to facilitate this value-construction process. At Tillamook Bay, three steps were required: defining program scope, identifying opportunities for public involvement, and clarifying key trade-offs.

3.1. Defining program scope

The TBNEP initiative was charged with identifying and evaluating an inventory of possible actions that could be taken to restore damaged aspects of the environment or to improve conditions within the Tillamook watershed. When our project began, approximately 150 actions were under consideration. An initial analysis showed that many of these actions were overlapping, many were not well defined (e.g. in terms of their expected scope, cost, or impacts) and the temporal relationships among them were not well understood. As a result, we worked with the NEP staff and the TBNEP Management Committee to (a) reduce the number of actions to a more manageable level and (b) understand the linkages among actions, so that their associated impacts could be predicted with more accuracy.

A first step in this process was to elicit the help of TBNEP staff, community leaders, and stakeholders (as described in the next section) to work through the entire set of actions and to ask, for each, the simple question 'why does this matter?' This provided a way to track the rationale for each action and, in some cases, pointed out the need to define more clearly the intended purpose. This process resulted in a list of fundamental objectives for the project, showing what ultimately mattered to the TBNEP in terms of the desired outcomes from project initiatives. Together, these objectives provided a basis for decid-

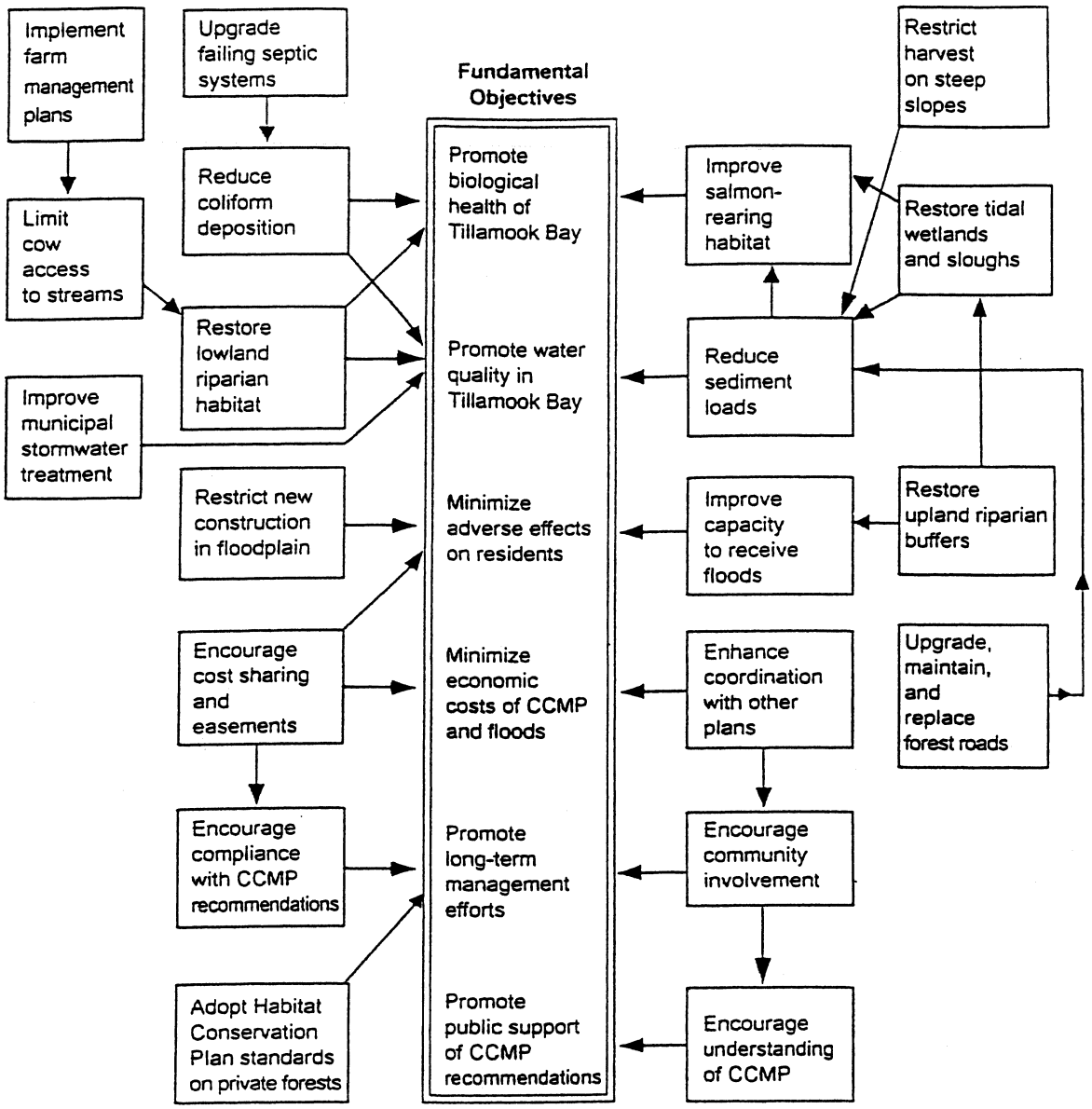

Fig. 1. Means-ends network for Tillamook CCMP. Source: Gregory (2000a). The six fundamental (ends) objectives are shown in the center box. Means objectives, many of which become actions in the Tillamook CCMP, are shown at the sides. An arrow denotes influences, between means objectives and from means to ends.

ing what should and should not be included as part of the project (CCMP) recommendations as well as an initial mechanism for linking costs and benefits of the intended actions.

Many of the key linkages of this type are shown in Fig. 1, which is a 'means-ends network' (Keeney, 1992), reflecting the results of the discussions on objectives held with members of the TBNEP Management Committee and with representative stakeholder groups. The figure depicts objectives considered to be of fundamental importance (the 'ends', shown in the middle portion of

the figure) and objectives considered important because they help to achieve these ends (the 'means' to the ends, shown along the sides of the figure). This type of analysis was useful in showing the relationships among actions were and underscored the fact that, for many of the valued ends, different means could be used to achieve them. Knowing more about these relationships also proved helpful in recognizing complementarities and identifying redundancies, in the sense of knowing when two or more actions addressed the same problem.

Data on the range of impacts of possible actions were very sparse. Drawing on reviews of the published literature and recent unpublished studies, we summarized the available quantitative and qualitative information for each potential action and noted our assessment of its quality. Impact assessments were also derived from interviews conducted with scientific experts and state and local agency representatives. Many of these interviews were conducted as 'expert judgment' elicitations (Keeney and von Winterfeldt, 1991), working with several experts at a time and using differences in their expressed opinions (e.g. of impact magnitudes and/or probabilities) as the basis for more in-depth questions.

3.2. Opportunities for public involvement

Involvement by the local community in development of the CCMP is one of the two cornerstones of the national NEP effort. At the time we began our project, the three most visible elements of the TBNEP public involvement effort had been (1) public meetings held more than one year earlier (late 1996 and early 1997), at which participants were asked to state desired components of the CCMP; (2) a mail questionnaire, sent to a small sample of Tillamook County landowners to learn their opinions regarding key issues, and (3) local participation on the 25-person Management Committee, composed largely of county, state, and federal agency representatives.

From our perspective, the earlier stakeholder-involvement processes had been insufficient. This was not due to lack of effort: because the TBNEP initiative was perhaps the 75th major study to be conducted in Tillamook county over the past 10 years, stakeholder burnout was a real problem and many people simply ignored program invitations to participate.[2] Moreover, the earlier public meetings had created unrealistic expectations by highlighting initiatives that often were not appropriate for the TBNEP program. In addition, many local political interests (e.g. county commissioners, state representatives) felt extremely protective of what they perceived to be incursions into their turf by outsiders (e.g. TBNEP staff paid by the federal government, our project team and other consultants). Thus, it was clear that our efforts would need to be distinguished from the previous TBNEP (and other) initiatives.[3]

We sought to develop a structured process for helping community members understand and address the more difficult trade-offs among economic, environmental, and social concerns (McDaniels, Gregory, and Fields, 1999). This approach is quite different from that of more broad-based public involvement efforts (Chess and Purcell, 1999). A recent review of participation in US watershed planning initiatives (Duram and Brown, 1999), for example, advocates the use of public meetings and information programs as methods for soliciting participation. Although these approaches can provide useful general input, the pressing need for the TBNEP was to find a way to involve local residents meaningfully at a detailed, action-specific level and to ensure that the judgments of participants were informed by and recognized the complex, multidimensional nature of the types of program initiatives under consideration.

[2] This concern is echoed in a growing literature that focuses on the high costs and uncertain gains of much of what currently comes under the heading of participation for aiding deliberative agency decision making; for example, see Rossi (1997).

[3] In a recent review of the influence of public participation initiatives on environmental policies, Chess and Purcell (1999) make the point that the ability to modify traditional participatory forums to meet the goals of the community is often a critical determinant of project failure or success.

One of our first steps was to hold detailed value-elicitation sessions with three leading stakeholder groups (dairy farmers, private and state foresters, and local residents concerned about flooding) to identify possible CCMP actions that would be responsive.[4] Similar sessions to clarify stakeholder values and objectives were held with members of the TBNEP management committee, with several local groups (e.g. the Tillamook Futures Council), and with a variety of individuals (e.g. the county planner, a high school principal). These sessions used value-structuring tools of decision analysis, such as value trees, influence diagrams, and means-ends networks (Clemen, 1996), to assist participants in thinking through and expressing their values; stakeholders' response to the application of analytical tools to assist in the deliberative process was positive. The stakeholder groups also were very helpful in clarifying cause-and-effect relationships, such as the expected impact of improvements in forest roads on sedimentation and fish passage.

Based on these meetings, the following three critical but controversial ecosystem-management actions were chosen for further in-depth analysis and valuation:

1. Limiting livestock access to streams
2. Protecting and restoring tidal wetlands
3. Upgrading forest management roads

Taken together, these three actions constituted the heart of the CCMP initiative and simultaneously represented much of the promise, as well as much of the controversy, associated with the TBNEP plan.

[4] We were fortunate in that our work at Tillamook was able to build on the results of an ongoing, broad-based 'Goals and Visions' study coordinated through the University of Oregon. The client for this study was the Tillamook Futures Council (TFC), a recently established local group of some twelve leading citizens whose purpose is to aid the local population in planning an improved future for the County. Following discussions with local residents, we initiated contacts with the TFC Chair and several Council members. Several influential TFC members also agreed to help us facilitate the local stakeholder groups, which provided an element of trust as well as continuity with previous study efforts.

3.3. Clarifying key trade-offs

Trade-offs are at the heart of developing an acceptable resource management strategy or plan. A fundamental construct of our project was the belief that an important benefit of public involvement is the identification of differing stakeholder perspectives and that this information—once made salient to participants through the use of decision aids—is key to the development of broadly acceptable actions (see National Research Council, 1996). This was echoed in the early meetings with stakeholders, who were presented with information about trade-offs (e.g. relating to the desired scale or intensity of an activity) and, in response, actively sought information that would help them to make more informed choices within the domain of technically feasible options.

A primary concern for participants was the inherent complexity of comparing actions that differed across many dimensions. As an aid to addressing these trade-offs, several techniques were introduced that helped to focus attention on the dimensions of value exhibiting the greatest differences in anticipated impacts. For example, 'even swap' techniques (Hammond et al., 1999) were used to simplify a policy choice by making sequential trade-offs between pairs of objectives to establish equivalences on one dimension. Because the objective then fails to differentiate between the options, it no longer needs to be considered when choosing among alternatives. A detailed example is provided in the next section.

Two additional perspectives on trade-offs also were important to the overall study design. One came from the EPA Office of Water, which desired dollar-based values for environmental improvements that might reflect a more complete understanding of the overall pros and cons of program actions than estimates obtained from more conventional economic studies. Another, quite different objective was heard from the Tillamook Futures Council, which desired detailed information on the associated local distribution of economic, social, and environmental costs and benefits. This distributional information was (correctly) considered essential to the development of a package of activities that would

simultaneously be acceptable to the local community and to state and federal regulators. Many actions that could impose costs on local individuals or industries—such as the provision of additional fencing alongside streams to protect aquatic habitats and water quality from intrusion by livestock—were eligible for grants, offsets, or other forms of cost-sharing that would reduce the burden on local residents. In such cases, the important question was not only 'what is the cost of the action?' (e.g. in terms of dollar costs per foot of fencing) but 'how will the anticipated costs be split among the beneficiaries?' As anticipated by the Tillamook Futures Council, the responses of stakeholders based only on total costs were difficult to interpret and, in many cases, misleading.

One problem we encountered in meeting these tradeoff-based objectives was the lack of information regarding the scale and timing of proposed actions. An example is provided by the action designed to upgrade forest management roads, where the leading plan called for about 70 miles of roads to be improved, each year for 10 years, at an annual cost of US$3.5 million. A reasonable question to ask was: After the first 175 miles of roads (approximately 2.5 years of effort) have been upgraded, what percentage of the total benefits will be realized? This question brings in the economist's familiar concept of marginal analysis, comparing the costs and benefits of different amounts of an action. In this case, the results of expert interviews demonstrated that after upgrading one-quarter of the roads about three-quarters of the benefits would be realized, which suggested that it might not be worthwhile to spend another 75% of the money (roughly US$26 million) to realize only 25% of the benefits.

4. Evaluating policy options

A variety of alternatives were considered to meet these evaluation and policy objectives, including representative stakeholder groups (Gregory and Keeney, 1994), referenda (McDaniels, 1996), public-value forums (Keeney et al., 1990), decision-pathway surveys (Gregory et al., 1997), value-integration workbooks (Gregory, 2000b), and structured individual elicitations (Keeney, 1982). Our criteria included attracting the interest and cooperation of local participants, encouraging careful information processing, facilitating the examination of tough trade-offs across multiple value dimensions, and stimulating guided discussion and learning among community members. We also wanted to develop a mechanism that would have the capacity to make explicit comparisons across the different proposed levels of an action (thereby addressing issues of scope and scale, as noted earlier). In addition, we sought to ensure that the evaluation process would be cognitively valid, in the sense of posing plausible and realistic judgments, and economically sophisticated, in the sense of yielding useful quantitative and qualitative insights into the economic costs and benefits associated with proposed project actions.

After extensive consultations with TBNEP staff, we decided to develop a short workbook containing evaluation questions that individuals would complete as a paper-and-pencil task. Small-group sessions consisting of eight to twelve people were determined to provide the best forum for informed evaluation decisions, with groups co-led by an analyst (from the project team) and a local citizen (familiar with the TBNEP). It was felt that this format would facilitate focused discussions among community members and allow questions about missing facts or the elicitation context to be easily asked by participants and answered quickly, either by the analyst or by the local facilitator, prior to completion of the evaluation question by each participant.

4.1. Workbook design

Several considerations guided the overall design of the evaluation workbook and workshop sessions. A first decision was that the economic values information should be elicited in terms of an expression of social willingness to pay (e.g. is this a good use of society's scarce funds, resulting in additional state and/or federal taxes?) rather than in terms of an individual willingness to pay (e.g. is this something for which you would be

willing to pay 5 or US$10?, as in a typical contingent valuation study). We chose this approach for three reasons. First, the results of many studies of the 'good causes' effect (Kahneman and Knetsch, 1992) show that individuals are willing to pay small amounts of money for nearly any good cause. In our opinion, they are providing a measure of attitudes (or attitudinal dispositions), not a measure of economic value. Second, the notion that an individual would make a personalized payment for a public good such as improved salmonid habitat makes little sense in the real-world policy climate of Oregon or Tillamook County, where most residents are well aware that county, state, and federal funds assist in paying for designated environmental improvements. In this light, asking for an individual willingness to pay response is equivalent to asking for a charitable contribution (which people do on an individual basis) but makes little sense as a real-world economic payment mechanism. Third, asking participants to state whether the specified use of social funds is a good idea more closely captures the concept of economic opportunity costs. Overall, we believed that this approach to value measurement was more likely to provide realistic estimates of the true economic worth of proposed actions.

Another design decision concerned the desired metric for information about the values and preferred choices of stakeholders that would be provided to environmental policy makers. In some cases, this information was best reported in terms of assigned dollar values for potential environmental improvements (Freeman, 1993). In other cases, however, we believed that environmental values were best reported directly in terms of the trade-offs across options that participants were willing to make or in terms of the preference rankings implied by their choices. When designing the evaluation tasks, we therefore supplemented the use of dollar-based questions with pair-wise choices and, at other times, asked participants to delegate points across two or more competing options. Particularly when the policy initiatives under consideration involve a mix of economic, environmental, and social/cultural impacts, research suggests that the quality of information provided by these direct judgments of participants often will be higher than if individuals are required to undertake the additional step of translating expressed values into a monetary measure of worth (see Kahneman et al., 1999; Peterson and Brown, 1998).

4.2. Workbook organization

We wanted the evaluation process to mimic, as closely as possible, a cognitive sequence that followed the rules of good decision making (e.g. the PrOACT model proposed by Hammond et al., 1999). Yet we also wanted a process, and a sequencing of questions, that would seem natural and familiar to participants. Furthermore, the questions needed to provide useful input to the three separate, albeit related, policy objectives of the TBNEP, the EPA, and the TFC.

Our response was to design the workbook in three parts. In the first part, titled 'Action Alternatives', participants were asked to make choices among policy alternatives for the three key actions—limiting livestock access to streams, protecting tidal wetlands, and upgrading forest management roads—selected from the draft CCMP. This information was especially useful to the TBNEP in establishing priorities across elements of their plan. The second part, titled 'Detailed Choice Tasks', looked in depth at only one of the three actions (with the emphasized action varying among groups) and provided a mechanism for eliciting trade-offs across an action's objectives as a means for refining respondents' estimates of its economic benefits and costs. This information was of most use to the EPA, Office of Water in estimating the economic benefits and costs of its sponsored programs. The third part, titled 'Staying in Contact', inquired about the degree of involvement that participants desired in the ongoing planning of economic and environmental initiatives within Tillamook County. This information (which is not included in the later discussion of results) was of special interest to the Tillamook Futures Council in planning their agenda and activities.

Each of the three selected actions were presented in terms of two alternatives (labeled plan A

and plan B) which provide different levels of intensity (see Fig. 2), as shown by the magnitude of changes (e.g. low vs. moderate improvement) and their frequency (e.g. one-time vs. ongoing application). This presentation reflects both the realistic nature of these decisions for the TBNEP managers and extensive research in judgment and decision making which shows that the quality of a choice typically is improved to the extent that easily comparable information is available on several alternatives and their attributes (Hsee, 1996).

Three benefits attributes were shown for each action. Two cost attributes were provided for two of the actions (Limit Livestock Access and Restore Tidal Wetlands), with their relative significance varying between the two plan alternatives. To incorporate these differences in the economic evaluations, two different choice tasks were set up for each of these actions, thus providing information about the relative benefit–cost trade-offs associated with each comparison. For the third action (Upgrade Forest Roads), only one important type of cost varied between the alternatives, so for this action only one choice task was required. A matrix was used to present the anticipated trade-offs, with one level of costs and benefits held constant across the two choice tasks so as to facilitate cost comparisons and trade-offs.

	PLAN A (one-time)	PLAN B (ongoing)	PLAN C "Better"
+ Benefits:			
Increased storage for floodwaters	low improvement	moderate improvement	
Increased off-channel coho, chinook, and steelhead habitat	low (200 acres)	high (750 acres)	
Lower pollution levels in Tillamook Bay	moderate	moderate	
– Costs:			
Loss of access to productive farmland	low	low	
Federal and state taxes for dike removal, replanting, and land purchase	low $200,000 ($1,000/acre)	high $2.2 million ($3,000/acre)	

Fig. 2. Example choice task B: protect and restore tidal wetlands (time line: next 5 years).

Fig. 2 shows an example, presenting the benefits and costs for two levels of activity associated with the designated action 'Protect and Restore Tidal Wetlands.' Plan A (with actions taken one-time only) is the lower level of intensity, and plan B (with actions taken on an ongoing basis) is the higher level of intensity.

The sequence of questions first asked which of the plans was preferred on the basis of the information provided in the table. This information was then altered, based on their response, to show relatively higher costs or benefits in order to define more closely the estimated value. For example, in the Tidal Wetlands choice tasks, those who initially preferred Plan A were asked next if they would change their minds (i.e. prefer plan B) if the costs associated with plan B were to decrease by US$1.2 million (thus making Plan B relatively more attractive).[5] Subsequent questions allowed a closer specification of the range of economic values held by participants for components of the action, permitting translation of the responses into social willingness-to-pay values for designated activities. The design of these questions used a skip pattern whereby, for example, respondents would go to question b or c based on their answer to question a. This 'pathway' type of question sequencing is a common feature of many interview and survey designs (Schuman and Presser, 1996; Gregory et al., 1997).

Participants were next asked to rank the costs and the benefits, respectively, of an action in order of their significance, by assigning points to their first choice, second choice, and so forth. These questions provided information to the TBNEP regarding the expressed priorities among components of these actions—which elements are most attractive and which are least attractive—and provided important information for designing mitigation initiatives or for guiding revisions to Plan components. A third, open-ended proposed plan C also was shown. As noted in the work-

[5] As part of the introduction provided to each workshop, participants were instructed that they would be presented with new information about the consequences of alternatives in the course of completing the workbook, which in turn might influence their choices.

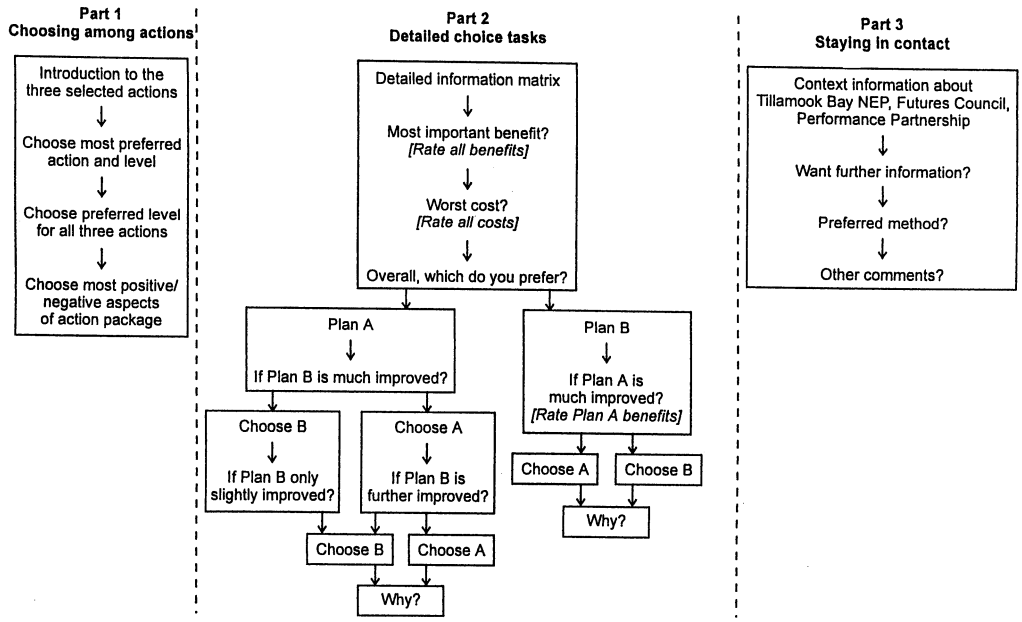

Fig. 3. Flowchart for Tillamook evaluation workbooks.

book (and emphasized by the facilitator), this was included to prompt participants to think about better ways that the same benefit levels could be achieved. A set of questions at the end of part 2 of the workbook (described below) allowed more detailed answers about desired components of plan C. A survey flowchart, showing the sequence of the workbook questions, is presented in Fig. 3.

4.3. Workshop implementation

Five groups were held over the course of two days in mid-January, 1999.[6] A total of 89 people took part in these workshops, with 79 surveys (89%) completed and analyzed. Participants in the small groups were drawn from a large pool of local residents (approximately 450 persons) selected at random from lists of utility ratepayers; some of the participants also had been involved in the earlier TFC 'Goals and Visions' survey. People were contacted through the mail and also received a later follow-up phone call. All groups were held at a local, centrally-located meeting space. On the advice of the TFC, no payment was given to the participants in the workshops, although the provision of a free meal (served by a well-known local chef) was advertised widely.

Each of the groups was presented with one of the five choice tasks. Most participants took between sixty and ninety minutes to complete the workbook. A one-page information sheet, prepared by a locally-based agency, was passed out and discussed briefly at the start of the workshop session to give participants an initial, shared perspective on the status of other relevant regional and state environmental or land-use policy initiatives.

5. Evaluation results

This section summarizes results of the evaluation workbooks. The discussion begins with the part 1 comparison across the three selected actions. The part 2, more detailed evaluations are then presented for each of the three selected criti-

[6] A previous effort to conduct the groups in December, 1998 had to be cancelled because of severe floods; as a result, the issue of flood control was highly salient.

cal actions. Results from part 3, which asked for respondents' desired future involvement in local environmental decision making, are omitted from this summary.

5.1. Choosing among actions

The booklets began with a description of the three actions and their principal benefits and costs. When asked which of the three actions should be selected if only one were possible, nearly half of all respondents (37 of 79, or 47%) preferred the action Protect and Restore Tidal Wetlands. About one-quarter of respondents favored Upgrading Forest Roads (21 or 27%) and almost as many individuals favored Limiting Livestock Access (20 or 25%). When asked about the preferred level of intensity (for their selected action), a majority of respondents consistently favored the higher level (i.e. favored plan B over plan A). Overall, respondents were willing to spend more to achieve larger environmental gains. This was particularly true for the most favored action, Protecting Tidal Wetlands.

When asked to state the most positive aspect of this package of actions, many respondents cited anticipated improvements in the quality of the environment (e.g. the need for 'clean water and salmon habitat'). Others favored an aspect because it would help with implementation ('probably the most realistic way to get something done') or because it addressed the distribution of impacts ('spreading costs among citizens who benefit'). A high number of respondents addressed trade-offs in their response ('greatest benefit for the money'; 'balance short-term economic costs against long-term environmental gains'). The most frequently cited negative aspect of the actions was cost. Approximately one-half of all respondents noted the burden of costs in some form (e.g. to taxpayers, to farmers, to foresters). Several participants also noted restrictions on traditional rights (e.g. the 'dairy industry resists restrictive actions') and what was perceived to be the excessive role of non-local regulators.

Most respondents expressed only slight knowledge of the purpose or contents of the CCMP. Nearly two-thirds (62%) said they 'didn't know' if the action they favored was covered in the CCMP, and only 14% thought that it was included. These responses suggested that more could be done to communicate effectively with local residents and were useful from the standpoint of organizing the next phase of outreach and communications initiatives conducted by the TBNEP.

5.2. Trade-off choice tasks

The first trade-off question asked participants to choose between the lower intensity (A) or higher intensity (B) plan. As summarized in the table below[7], fully two-thirds of participants across all five groups (53 of 79, or 67%) selected the higher-intensity plan, a result consistent with their part 1 responses.[8] Only respondents to 'Limit Livestock Access 2' showed an overall preference for the less-intensive plan A. Subsequent questions asked participants to provide a more detailed assessment (for one action) of the economic value placed on provision of the stated benefits.[9]

	FR1	LL1	LL2	TW1	TW2	totals
Plan A	3	6	7	7	3	26
Plan B	8	11	4	12	18	53
Totals	11	17	11	19	21	79

[7] Throughout this section, the five workbooks will be referred to as FR1 (Upgrade Forest Roads), LL1 & LL2 (Clean Streams by Limiting Livestock Access), and TW1 & TW2 (Protect and Restore Tidal Wetlands).

[8] Such consistency checks provide important information about the reliability and construct validity of responses to workbook questions.

[9] Readers familiar with environmental valuation techniques such as paired comparisons (Peterson and Brown, 1998), choice experiments (Adamowicz et al., 1998), and contingent choices (Mazzota et al., 1998), will recognize similarities to the interview/survey method that we describe here.

5.2.1. Protecting and restoring tidal wetlands

A total of 40 participants, shown above in groups TW1 or TW2, focused on the action Protect and Restore Tidal Wetlands. The two groups differed in terms of the cost component that was used to clarify trade-offs, with land purchase costs varied for TW1 participants and losses of pastureland varied for TW2 participants. This discussion looks first at the TW2 results, then TW1.

For the TW2 respondents, an initial value estimate can be obtained directly: the 18 respondents who selected plan B over plan A are willing to have society pay an additional US$2 million (for a total of US$2.2 million) to create 450 additional acres of habitat, along with a small improvement in floodwater storage. Thus, the social value of each acre of habitat is set at a minimum of about US$5000. The true value could be much higher, but (as is always the case with willingness-to-pay questions) the response shows only that the economic value of the action, for those participants initially selecting plan B, is at least this high.

The next questions refined these valuation estimates by presenting respondents with a structured set of additional choices. Those participants who initially preferred plan A (only 3 of 21 in this example) were asked whether a reduction in the cost of plan B would shift their vote (these participants are noted in the left-hand box, titled 'plan A', shown in the middle portion of Fig. 3). The cost reduction—in added federal and state taxes for dike removal, planting, and land purchases—was from 2.2 to US$1.0 million. All three individuals now revised their choice and preferred plan B. Since the cost of plan A is shown as US$200,000, these individuals are willing for society to pay at least US$800,000 for the additional 450 acres of habitat (the difference between plan A and plan B) as well as a small improvement in floodwater storage, or about US$1800 per acre as a lower bound. An upper bound value (US$5000) already has been set by their initial rejection of plan B. By responding affirmatively to the next question in this sequence, which asked if they would still chose plan B were its costs increased by US$500,000 (to US$1.5 million), these three individuals effectively stated their lower-bound estimate of value as US$1.3 million divided by 450 acres, or about US$3000 per acre.

Those participants who initially preferred plan B were asked whether a costless increase in one of the stated benefits of plan A would result in a shift of their vote. For the one-half of participants selecting an improvement in floodwater storage (from low to moderate levels), only one person stayed with plan B as their preferred choice. This response pattern places a surprisingly high value on initiatives that could be undertaken to decrease the risks of flooding, and implies that plan B's improvement in off-channel fish habitat is not sufficiently highly valued (by this subset of participants) to warrant the proposed additional US$2 million in added taxes.[10]

Results were strikingly different for the other half of participants, those selecting an improvement in off-channel habitat for salmonids. In this case, no participants voted to change plans: 75% voted to stay with plan B, and 25% now considered the two plans to be of equal value. Because the choice varied only in terms of one benefit (slightly better floodwater storage) and one cost (an additional US$2 million in taxes), this response pattern implies that, for these respondents, the economic value of the decrease in flood risks is worth at least US$2 million.

The 19 participants in TW1, the other Tidal Wetlands group, were provided with detailed information on the second major source of costs, the anticipated loss of either 200 acres of marginal farmland (under the low-intensity plan) or 750 acres (under the high-intensity plan). This is an important consideration in Tillamook County, in light of the economic and cultural prominence of the dairy industry and a perceived shortage of

[10] None of these cost figures reflected discounting or present-value calculations respecting the fact that, because expenditures will be made over periods of several years (in some cases, decades), the value of dollars spent in the far future is relatively less than for dollars spent in the near future. A limited attempt was made to distinguish between the creation of gains, in the form of additional environmental benefits, and the restoration of losses, in the form of restoring widely accepted historical conditions. This difference could be important to the extent that research results suggest the value placed on actions taken to restore a loss is likely to be higher, often by a factor of two or more, than the value of actions to create a gain (e.g. Knetsch, 1990).

pastureland. Despite this concern, nearly two-thirds of the participants (12 of 19) initially favored the higher-intensity plan. Costless improvements in the components of this plan—better floodwater storage and additional fish habitat—made the two plans of equal value for at least four of the participants: this trade-off result implies that the value placed on one acre of marginal farmland (estimated value: US$3000–5000) is about equal to the value placed on one acre of improved fish habitat.

These results suggested that linking restoration of tidal wetlands to floodwater storage was likely to increase public acceptance of proposed expenditures (e.g. for the purchase of marginal farmland and the conversion of this acreage to wetlands). Second, they suggested that the economic value of these improvements was quite high, supportive of payments on the order of at least US$3–5000 per acre. The upper end of this value is approximately equivalent to the price of medium-quality farmland in Tillamook County (reflecting an estimated annual value for the services provided by moderate-quality pasturelands of about US$400–500/acre, or—when capitalized at an interest rate of 10%—roughly US$4000–5000 per acre) and exceeds the average price of marginal, lower-quality farmlands. The high assigned value expressed by workshop participants therefore suggested that the restoration of degraded wetlands may be a popular initiative at a scale well beyond the maximum 750 acres then under considerations by the TBNEP.

5.2.2. Cleaner streams through limiting livestock access

This was the most controversial of the three actions under consideration, as demonstrated by the close results between participants selecting the 'fencing + 15-ft. riparian buffer' lower-intensity plan (13 of 28) and those selecting the 'fencing + 50 ft.' higher-intensity plan.[11] Both plans were shown to improve the image of the dairy industry significantly, although the 50-ft. buffers would provide for a larger decrease in bacterial pollution and a dramatically higher (as much as tenfold) boost in fish habitat and production. This benefit was shown to come at a high cost, however, in terms of the anticipated greater loss of productive farmland (3000 vs. 300 acres) and a financial cost approximately twice as high (US$ 6 million over 5 years vs. US$3 million). Even though the anticipated expenses to farmers and local agencies could be large (since only 50% of costs were shown to be covered through grants and offsets), further questioning revealed that the primary concern for workshop participants was the loss of farmland. For example, a reduction (to US$4.5 million) in the financial costs of the higher-intensity plan had no effect on participants' choice of plans, whereas a reduction in the loss of productive farmland resulted in one-half (three of six) of participants choosing the wider buffer widths. If these results mirror community preferences, they suggest that a majority of local residents would support the use of substantial public funds (as much as US$1.2 million for each of 5 years) as part of a plan to build new fencing and to plant 100-ft. (counting both stream sides) riparian buffers.

However, the results for both fencing plans involving 'cleaning streams by limiting livestock access' also offer a warning. Whereas participants in the other groups (i.e. those responding in detail to tidal wetlands or forest management actions) willingly followed along with the questions asked in the workbooks and responded to all designated cost and benefit trade-offs, about one-third of participants in the 'limit livestock access' groups failed to complete their questionnaires. It may be that these trade-offs were less well specified in the workbooks, but based on the open-ended written comments provided by participants, the most likely explanation is that the concept of limiting livestock access is emotionally charged. At least a vocal minority of community members did not appear to readily accept the concept that this type of initiative is appropriate to the federally funded TBNEP program and, therefore, voiced their disapproval by refusing to respond to some of the workbook questions.

[11] As explained during the group discussions, these buffer widths refer to only one side of the stream whereas work would be done on both sides; thus, 500 miles of fencing with a 50 ft. buffer would translate to 250 miles of fencing on both sides of the stream and a total of 100 ft. (50 ft. on both sides) removed from pastureland or other current uses.

5.2.3. Upgrading forest management roads

Over two-thirds of respondents in this smallest group[12] chose the plan B option, implying that they supported payments of US$7 million per year to improve water quality, increase fish passage, and reduce the risks of flooding in lowland areas. When plan A was improved to include either additional reductions in sediment delivered to streams or higher levels of fish survival, only one person switched their choice. Thus, the majority of participants believed the proposed reductions in sedimentation and increases in fish survival were worth the substantially higher cost of plan B (an additional US$3.8 million per year for each of 10 years). Keeping the small sample size in mind, this result suggests a surprisingly high level of support among local residents for an enhanced forest road-improvement program.

6. Discussion

The workbook results generally show strong support for actions to protect and restore tidal wetlands and an endorsement of several higher-intensity—even if more costly—initiatives, including improvements in forest roads and the construction of additional fences along streams. Both quantitative and qualitative information is provided on the economic value of specific TBNEP initiatives; for example, the estimated social value for each additional acre of salmon habitat is approximately US$5000, and a high economic value also is placed on the use of wetlands for purposes of floodwater storage. In addition, the results demonstrate the diversity of views held by citizens and underscore the need for multiple public involvement and communication channels depending on the interest and concerns of community members.

This evaluation of CCMP actions is subject to several obvious limitations: only three (albeit key) actions are considered, sample sizes are moderate, and both the ecological impact and willingness-to-pay estimates lack precision. However, we do not believe that additional input into the economic estimates of value would be warranted until it is matched by parallel activity designed to develop more precise estimates of the anticipated environmental impacts. At the time of our study, useful quantitative information was available to describe the environmental impacts of the three highlighted actions. For most other actions, however, the available information—particularly on the benefits side—was far lower in quality or non-existent. Thus, even if we had expanded the set of actions under consideration or developed a mail-survey version of the evaluation instrument, the quality of responses would be limited by ambiguities and uncertainty in the environmental information base. The same is true regarding the lack of precision in willingness-to-pay estimates: more precise dollar values add little clarity when the cognitive basis for additional precision is lacking or when impacts on the items under consideration (e.g. numbers of additional fish, acres of lost farmland, days of additional fishing) remain poorly defined.

For example, one of the practical decisions facing TBNEP managers was whether it was worthwhile to purchase marginal farmland at US$2000–3000 per acre and attempt to restore its full range of natural ecological services. For this decision the important consideration was whether most community stakeholders would be willing to support these purchases. Our results strongly suggest that they would. The philosophical decision was whether more detailed economic analyses (using CVM or other techniques) were warranted to determine whether the average per-acre value is closer to US$3500 or 5000. In our opinion, this information (even if possible to obtain, which we doubt) would not have been useful in the context of the decision at hand. Further, variants of threshold framing—addressing the question 'is the value most people hold equivalent to at least

[12] Because of the simpler structure of the designated cost-benefit trade-offs for forest roads, as noted earlier, we conducted only one group for this action rather than two groups (as for the other two actions under consideration), hence the smaller number of participants.

$x'—are familiar to most managers. They reflect a decision- and trade-offs-focused, rather than number-focused, evaluation approach which has strong roots in the work of early resource economists such as Krutilla (1967) and decision analysts such as Keeney (1982).

In addition, our study had a second and equal focus to encourage public involvement and community participation. In this context, the results of our early decision-structuring efforts to refine the list of CCMP actions, provide information on their costs and benefits, and assist in developing a stakeholder-based approach to identifying high-priority initiatives were considered by the TBNEP staff and local participants (e.g. the Tillamook Futures Council) to be at least as valuable as the quantitative estimates of value provided through the evaluation workbook results. Combined with the high visibility in the community that was provided by the evaluation workbook exercise and the value-structuring small groups, there developed a local sense of ownership of the results, and a desire to incorporate the expressed trade-offs and action priorities into the management plan, that is quite different from what is typically observed in response to more conventional evaluation exercises or general population surveys.

This dual emphasis on analysis and deliberation is consistent with the mandate of the TBNEP, which was to provide a plan for improving the quality of the Tillamook Bay estuary that reflected both scientific opinion and local participation. It is also in keeping with the recommendations of reports such as Understanding Risk (National Research Council, 1996). However, we found that the staff's primary mandate had not been to work with community residents to assess the costs, benefits, and trade-offs of actions but, instead, to work with technical experts to come up with lists of science-based environmental activities (Imperial et al., 1993). Overall, there did not exist, within either the locally based staff or the national NEP program as a whole, a sufficient appreciation of the importance of decision-aiding tools or, more generally, the influence of a social-science perspective in moving beyond a conventional list of 'resource management' activities to the construction of a broadly acceptable portfolio of investments over time.

Linking scientific input and local participation effectively will require a greater familiarity and comfort with analytical techniques such as eliciting objectives from community stakeholders, decomposing problems and actions into their component parts, and evaluating trade-offs across multiple dimensions of value. We anticipate, however, that this effort will be well worth the added costs (in staff training, for example) because it will result in more defensible project recommendations and a closer alignment of project efforts with existing local, state and national program goals. For many environmental management initiatives, such as the National Estuary Program, we believe that adapting a structured decision process and clarifying trade-offs among different stakeholder objectives are essential to the development of more effective, cost efficient, and broadly acceptable environmental policies.

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